

Remarks

I. Status of claims

Claims 1-21 were pending.

Previously withdrawn claims 11-21 have been canceled.

Claims 22-25 have been added.

Claim 2 has been rewritten in independent form.

II. Claim rejections under 35 U.S.C. § 103

The Examiner has rejected claims 1, 2, and 4-10 under 35 U.S.C. § 103(a) over Chou (U.S. 5,772,905) in view of Samsavar (U.S. 5,866,806).

A. The Examiner's Position

In the final Office action dated August 24, 2004, the Examiner asserted that:

It would have been obvious to one skilled in the art to measure tunneling current to align the mold and substrate of Chou because Chou teaches capacitance sensing as an electrical alignment technique and Samsavar teaches that the measurement of capacitance and the measurement of tunneling current may both be used to determine the relative proximity or alignment between two features. As such, capacitance and tunneling current measurements are recognized in the art as equivalent means for determining the alignment of two features.

In the Advisory action dated November 23, 2004, the Examiner asserted that (citations omitted):

...Samsavar was relied upon for teaching that the measurement of capacitance and the measurement of tunneling current are recognized in the art as equivalent means for determining the proximity or relative positioning of two features and the substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency.

The Examiner's position, however, is untenable because Samsavar's teaching cannot support the broad proposition that measurement of capacitance and measurement of tunneling current are art-recognized equivalent means for determining the positioning or relative positioning of two features. Indeed, such a broad proposition clearly is incorrect on its face because in some situations, such as when two capacitor plates are separated by insulating material, changes in capacitance between the two capacitor plates can be measured but changes in tunneling current between the two capacitor plates cannot be measured.

As explained in the Response dated October 25, 2004, Samsavar only teaches that a scanning probe tip can be used to locate an exposed surface feature either by sensing changes in capacitance, tunneling current, or magnetic parameter (see, e.g., col. 9, lines 15-16). In particular, Samsavar explains that (col. 9, lines 11-16; emphasis added):

... when system 20 is operated in a non-contact operational mode, where the tip is held at a small distance above the surface and scanned at a high speed over the surface along a search pattern, the sensor [24] senses changes in capacitance, tunneling current or magnetic parameter... Once this location is determined, the stylus or probe can be brought into contact or close proximity to the surface to measure the electrical, magnetic or geometric properties of the site.

Samsavar does not even hint that the sensor 24 is capable of locating non-surface features. Therefore, Samsavar does not support the Examiner's position that that measurement of capacitance and measurement of tunneling current are art-recognized equivalent means for determining the positioning or relative positioning of two features. At best, Samsavar supports the proposition that a stylus tip or probe tip can be used to locate a feature having a surface exposed (i.e., unobstructed by overlying material) for sensing of capacitance, tunneling current, or magnetic parameter by the stylus tip or probe tip. Samsavar does not teach that these different measurements are equivalent; rather, Samsavar merely teaches that these are different measurements that can be made with a stylus tip or a probe tip.

The Examiner does not dispute the fact that, in the capacitive-sensing alignment embodiment of Chou's system, the alignment mark 68 is covered by the thermoplastic polymer layer 20 which has a thickness of 50-250 nm (see col. 4, lines 58-59; FIG. 9). In addition, Chou does not teach or suggest anything that would have led one of ordinary skill in the art at the time the invention was made to modify Chou's capacitive-sensing alignment

embodiment by removing the portion of the thermoplastic polymer layer 20 overlying the alignment mark 68 and thereby expose the alignment mark 68.

In an attempt to address the failure of Chou to provide any motivation to expose the alignment mark 68 in his capacitive-sensing alignment embodiment, the Examiner has indicated that (Advisory action dated November 23, 2004; emphasis added):

Additionally, applicant argues that there is at least 55 nm of intervening material disposed between Chou's alignment marks 64 and 68 and this would preclude measuring a tunneling current between these alignment marks. Applicant appears to base this contention on figure 9 of Chou, which the examiner notes is a schematic diagram. As such, the depiction of features 64 and 68 in figure 9 of Chou cannot be taken as a representation of their actual placement in space. From the point of view that Samsavar's teaching made it obvious for one of ordinary skill to use tunneling current as the alignment means in Chou, it would likewise be obvious for the skilled artisan to use a configuration that would facilitate the successful implementation of the tunneling current methodology. ...

The Examiner's argument, however, is circular and therefore unpersuasive. In particular, the issue at hand is whether Samsavar made it obvious to use tunneling current as the alignment means in Chou. The fact that Chou's embodiment is incompatible with measuring a tunneling current rebuts the Examiner's unsupported conclusion that Samsavar made it obvious to use tunneling current as the alignment means in Chou. Yet the Examiner relies on his unsupported conclusion to dismiss Applicant's rebuttal.

Moreover, as pointed out above, the Examiner's broad assertion that measurement of capacitance and measurement of tunneling current are art-recognized equivalent means for determining the positioning or relative positioning of two features is not supported by Samsavar. Accordingly, the Examiner's failure to point to "some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings" is improper under MPEP § 706.02(j).

To summarize, Chou does not provide any motivation for exposing the alignment mark 68 in his capacitive-sensing alignment embodiment and Samsavar does not even hint that a stylus tip or probe tip could be used to locate an alignment mark that is covered by a layer of material, such as a thermoplastic polymer layer having a thickness of 50-250 nm.

Therefore, one of ordinary skill in the art at the time the invention was made would not have been motivated to replace the second capacitive-sensing alignment mark 64 with Samsavar's probe tip because such a person could not have reasonably expected that Samsavar's probe tip could have successfully sensed changes in capacitance, tunneling current, or magnetic parameter through the intervening thermoplastic polymer layer 20.

In addition, Samsavar does not teach or suggest anything about using his stylus tip or probe tip to align a patterned mold with respect to an alignment mark on a substrate carrying a moldable thin film. Therefore, Samsavar's disclosure would not have provided any motivation for one of ordinary skill in the art to attach a patterned mold to the sensor 24 and replace the sample 34 (see FIG. 1 of Samsavar) with the polymer-film-coated substrate 18 shown in FIG. 9 of Chou.

Since neither Chou nor Samsavar provides any motivation for the combination proposed by the Examiner it appears that the Examiner improperly has engaged in hindsight reconstruction of the claimed invention, using applicants' disclosure as a blueprint for piecing together the cited prior art to defeat patentability. Without a proper explanation for combining the cited prior art to arrive at the invention recited in claim 1, the Examiner has failed to establish a proper *prima facie* case of obviousness and the rejection of claims 1, 2, and 4-10 should be withdrawn.

B. Independent claim 1

Claim 1 has been amended and now recites:

Claim 1: A lithographic method, comprising:

forming a bottom layer and a scanning probe alignment mark on a substrate;

forming a thin film on the bottom layer leaving the scanning probe alignment mark exposed for interaction with a scanning probe;

aligning a patterned mold with respect to the exposed alignment mark based upon interaction of the exposed alignment mark with a scanning probe extended toward the alignment mark; and

urging the aligned patterned mold into the thin film.

As explained above, neither Chou nor Samsavar teaches or suggests anything that would have led one of ordinary skill in the art at the time the invention was made to form a thin film on the bottom layer leaving the scanning probe alignment mark exposed for interaction with a scanning probe, as now recited in claim 1.

In attempt to make-up for this failure in the teachings of Chou and Samsavar, the Examiner has argued that:

From the point of view that Samsavar's teaching made it obvious for one of ordinary skill to use tunneling current as the alignment means in Chou, it would likewise be obvious for the skilled artisan to use a configuration that would facilitate the successful implementation of the tunneling current methodology.

As explained above in § II.A, however, this reasoning is circular and fails to support a proper *prima facie* case of obviousness under MPEP § 706.02(j). In particular, the issue at hand is whether Samsavar "made it obvious to use tunneling current as the alignment means in Chou." The fact that Chou's embodiment is incompatible with measuring a tunneling current rebuts the Examiner's unsupported conclusion that Samsavar made it obvious to use tunneling current as the alignment means in Chou. Yet the Examiner relies on his unsupported conclusion to dismiss Applicant's rebuttal. Moreover, the Examiner's broad assertion that measurement of capacitance and measurement of tunneling current are art-recognized equivalent means for determining the positioning or relative positioning of two features is not supported by Samsavar. Accordingly, the Examiner's failure to point to "some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings" is improper under MPEP § 706.02(j).

For at least these reasons, the Examiner's rejection of independent claim 1 under 35 U.S.C. § 103(a) over Chou in view of Samsavar now should be withdrawn.

C. Independent claim 2

Claim 2, which has been rewritten in independent form, recites:

Claim 2: A lithographic method, comprising:
aligning a patterned mold with respect to an alignment
mark disposed on a substrate based upon interaction of a

scanning probe with the alignment mark, wherein the patterned mold is aligned based upon detection of a tunneling current between the scanning probe and the alignment mark.

As explained above, Chou does not provide any motivation for exposing the alignment mark 68 in his capacitive-sensing alignment embodiment and Samsavar does not even hint that a stylus tip or probe tip could be used to locate an alignment mark that is covered by a layer of material, such as a thermoplastic polymer layer having a thickness of 50-250 nm. Therefore, one of ordinary skill in the art at the time the invention was made would not have been motivated to replace the second capacitive-sensing alignment mark 64 with Samsavar's probe tip because such a person could not have reasonably expected that Samsavar's probe tip could have successfully sensed changes tunneling current through the intervening thermoplastic polymer layer 20.

Indeed, as explained in the Response dated October 25, 2004, for a tunneling current to be observed, the distance between a probe tip and an unobstructed surface feature must be less than a few nanometers (nm) so that the electron clouds (or wavefunctions) between the probe tip and the surface feature overlap (see, e.g., the highlighted sections on pages 2 and 5 of the portion of the Thesis by Matthew Ellis that was submitted with the Response dated October 25, 2004; also see the Background section of U.S. Patent No. 4,724, 318, which is referenced at col. 3, line 66 of Samsavar).

The Examiner has argued that:

From the point of view that Samsavar's teaching made it obvious for one of ordinary skill to use tunneling current as the alignment means in Chou, it would likewise be obvious for the skilled artisan to use a configuration that would facilitate the successful implementation of the tunneling current methodology.

As explained above in § II.A, however, this reasoning is circular and fails to support a proper *prima facie* case of obviousness under MPEP § 706.02(j). In particular, the issue at hand is whether Samsavar made it obvious to use tunneling current as the alignment means in Chou. The fact that Chou's embodiment is incompatible with measuring a tunneling current rebuts the Examiner's unsupported conclusion that Samsavar made it obvious to use tunneling current as the alignment means in Chou. Yet the Examiner relies on his unsupported conclusion to dismiss Applicant's rebuttal. Moreover, the Examiner's broad assertion that measurement of capacitance and measurement of tunneling current are art-recognized

equivalent means for determining the positioning or relative positioning of two features is not supported by Samsavar. Accordingly, the Examiner's failure to point to "some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings" is improper under MPEP § 706.02(j).

For at least these reasons, the Examiner's rejection of independent claim 2 under 35 U.S.C. § 103(a) over Chou in view of Samsavar now should be withdrawn.

D. Dependent claims 4-10 and 22-25

Each of claims 4-10 and 22-25 incorporates the features of independent claim 1 and therefore is patentable over Chou and Samsavar for at least the same reasons explained above in § II.A and § II.B. Claims 6-8, 22, and 23 also are patentable for the following additional reasons.

Claim 6 recites "applying a voltage between the scanning probe and the alignment mark to induce a tunneling current between the probe and the alignment mark." Claim 6 is additionally patentable over Chou and Samsavar for the reasons explained in § II.C.

Claim 7 recites that the scanning probe has a fixed spatial position relative to the patterned mold. Neither Chou nor Samsavar teaches or suggests anything about the position of a scanning relative to a patterned mold. Accordingly, there is no basis whatsoever for the Examiner's conclusion that claim 7 is unpatentable over Chou and Samsavar. In this regard, it is quite telling that the Examiner consistently has failed to address the features of claim 7 in each of his actions.

Claim 8 recites that the scanning probe is carried on the patterned mold. Neither Chou nor Samsavar teaches or suggests anything about the position of a scanning relative to a patterned mold. Accordingly, there is no basis whatsoever for the Examiner's conclusion that claim 8 is unpatentable over Chou and Samsavar. In this regard, it is quite telling that the Examiner consistently has failed to address the features of claim 8 in each of his actions.

New claim 22 recites "retracting the extended scanning probe before the aligned patterned mold is urged into the thin film." Neither Chou nor Samsavar teaches or suggests anything about retracting a scanning probe.

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New claim 23 recites that "the aligning comprises detecting a tunneling current between the scanning probe and the alignment mark." Claim 23 is additionally patentable over Chou and Samsavar for the reasons explained in § II.C.

III. Conclusion

For the reasons explained above, all of the pending claims are now in condition for allowance and should be allowed.

Charge any excess fees or apply any credits to Deposit Account No. 08-2025.

Respectfully submitted,

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